Serviente C, Matias A, Erol ME, Calderone M, Layec G.

The Influence of Covid-19-Based mRNA Vaccines on Measures of Conduit Artery and Microvascular Endothelial Function. FASEB J. 2022 May;36 Suppl 1. doi: 10.1096/fasebj.2022.36.S1.R2199. PMID: 35556032.

Abstract

With the emergence of severe acute respiratory syndrome 2 (SARS-CoV-2), leading to coronavirus disease 19 (COVID-19), a new class of messenger RNA (mRNA) vaccines have been broadly used. These vaccines have been associated with inflammatory sides effects such as myo- and peri-carditis. Despite the well-known link between inflammation and endothelial dysfunction, it is unknown whether these vaccines may transiently impair endothelial function, and therefore increase cardiovascular risk.

Aim:

To evaluate the influence of COVID-19-based mRNA vaccines on macro- and micro-vascular endothelial function in healthy adults. We hypothesized that macro- and micro-vascular endothelial function would be reduced following vaccination.

Methods:

Prior to, and ~48 hrs following the second dose of COVID-19-based mRNA vaccines, brachial artery flow-mediated dilation (FMD, macrovascular function), reactive hyperemia (microvascular function), and cutaneous intradermal microdialysis coupled with laser Doppler flowmetry (microvascular function) were measured in healthy young adults. For microdialysis, a standard local heating protocol (42^{0}C) was utilized, followed by infusion of the Nitric Oxide Synthase inhibitor Nω -Nitro-L-arginine methyl ester hydrochloride (L-NAME, 15mM), and induction of maximum vasodilation (43^{0}C+28mM Sodium Nitroprusside). Sites included: control (lactated Ringer's), ascorbic acid (10 mM), l-arginine (10 mM), and tetrahydrobiopterin (BH4,10 mM). C-reactive protein (CRP), a marker of systemic inflammation, was measured from fasting serum samples at both time points.

Results:

Vaccination (mRNA-1273, n=3 and BNT162b2, n=6, 5men/4women, 34±2yrs) induced an increase in CRP (pre: 0.2±0.1mg/dL vs. post: 2.1±0.5mg/dL, p=0.008, r-statistic=-0.89), but had no effect on FMD (pre: 3.6±0.9% vs. post: 4.6±1.1%, p=0.43, Cohen's d=0.28) or reactive hyperemia (pre: 20178±3236 AU vs. post: 28426±4573 AU, p=0.14, Cohen's d=0.55). There was no association between the change in FMD (r=-0.07, p=0.87) or reactive hyperemia (r=-0.48, p=0.19) and the change in CRP. Vaccination also had no effect on microvascular nitric oxide (NO)-dependent dilation (pre: 77.0±2.5% vs post: 77.3±2.4%, p=0.91, ηp 2 =0.002), nor was there an effect of microdialysis treatment on NO-dependent dilation (p=0.74, ηp 2 =0.05). Following vaccination, the difference in NO-dependent dilation relative to control was unaffected by treatment (p=0.25, η2 =0.11) with no difference in the effects of BH4 (6.3±4.9%), l-arginine (8.3±5.2%), or ascorbic acid (-2.6±4.2%, all p>0.05). The change in NO-dependent dilation at the control site was not related to the change in CRP (r=0.32, p=0.40).

Conclusions:

There was a significant inflammatory response to COVID-19-based mRNA vaccines ~48 hrs following the second vaccine dose. Despite this, macro- and micro-vascular endothelial function and NO-dependent dilation were preserved in healthy adults.